

Assessment of Aerosol Distributions from GEOS-5 Using the CALIPSO Feature Mask

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A-train sensors such as MODIS, MISR, and CALIPSO are used to determine aerosol properties, and in the process a means of estimating aerosol type (e.g. smoke vs. dust). Correct classification of aerosol type is important for climate assessment, air quality applications, and for comparisons and analysis with aerosol transport models. The Aerosols-Clouds-Ecosystems (ACE) satellite mission proposed in the NRC Decadal Survey describes a next generation aerosol and cloud suite similar to the current A-train, including a lidar. The future ACE lidar must be able to determine aerosol type effectively in conjunction with modeling activities to achieve ACE objectives. Here we examine the current capabilities of CALIPSO and the NASA Goddard Earth Observing System general circulation model and data assimilation system (GEOS-5), to place future ACE needs in context. The CALIPSO level 2 feature mask includes vertical profiles of aerosol layers classified by type. GEOS-5 provides global 3D aerosol mass for sulfate, sea salt, dust, and black and organic carbon. A GEOS aerosol scene classification algorithm has been developed to provide estimates of aerosol mixtures and extinction profiles along the CALIPSO orbit track. In previous work, initial comparisons between GEOS-5 derived aerosol mixtures and CALIPSO derived aerosol types were presented for July 2007. In general, the results showed that model and lidar derived aerosol types did not agree well in the boundary layer. Agreement was poor over Europe, where CALIPSO indicated the presence of dust and pollution mixtures yet GEOS-5 was dominated by pollution with little dust. Over the ocean in the tropics, the model appeared to contain less sea salt than detected by CALIPSO, yet at high latitudes the situation was reserved. Agreement between CALIPSO and GEOS-5 aerosol types improved above the boundary layer, primarily in dust and smoke dominated regions. At higher altitudes (> 5 km), the model contained aerosol layers not detected by CALIPSO. Here we present new results for a full year study using the new Version 3 CALIPSO data and most recent GEOS-5 model results.